A.P.101B-0417-1B,Supplement A.L.68,Nov.85

**SECTION 8** 

# **RADIO INSTALLATION**

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**SECTION 8** 

# **RADIO INSTALLATION**

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Note ... Combined theoretical/routeing diagrams for this installation are contained in A.P.101B-0417-10 (Servicing Diagrams Manual)

#### DESCRIPTION

#### General

1. The intercomm. system (A.R.I. 23099/24) is comprised of components of the Ultra UA60 system and provides facilities for intercomm. between the pilot, navigator and A.E.O., their use of the transmission and reception of the H.F., V.H.F. and U.H.F. 1 and 2 communications systems and reception of V.O.R./I.L.S., radio compass and Tacan A. F. signals. A ground crew amplifier is also installed to permit intercomm. between the cabin and four mic/tel sockets. These are situated one in the rear fuselage, one in the starboard wheel well and two in the port side of the bomb bay roof, one of these being just forward of frame 19 and the other just aft of frame 25.

#### Station boxes

2. A station box is fitted at each crew station. The pilot's box is located on the starboard coaming panel, the navigator's in the port lower corner of his instrument panel and the A.E.O. box is mounted at the starboard end of the navigator's coaming panel.

3. The station boxes are dedicated to the Sylvania Comms. (A.R.I. 23362/0) switch positions. Each station box provides facilities for the mixing of eight inputs and the selection of the required transmitter/ receiver from the four fitted to the aircraft. U.H.F. 1 and 2, V.H.F. and H.F. may be used separately or U.H.F. 1 or 2 and H.F. combined. The output from the crew member's microphone passes via a transistorized amplifier and the T/R selector switch to the T/R unit selected. Inputs from the H.F., V.H.F., U.H.F. 1 or 2, radio compass (A.D.F.), V.O.R./ I.L.S., marker & Tacan receivers are selected as required by operating individual push-on, push-off switches which incorporate volume controls. The U.H.F. 2, A.D.F. and Tacan signals are controlled by the same pushon, push-off switch. Intercomm. signals from the other station boxes and fuselage mic/tel sockets are similarly selected and the mixed inputs are fed to the associated telephones via another transistorized amplifier, incorporate in the station box.

4. The T/R selection switch, in addition to switching the positive and negative microphone lines, directs the positive telephone and the press-to-transmit (P. TO T.) lines to whichever T/R unit is selected. When a T/R unit is selected, the push-switch for that unit is by-passed and the

receiver output passes directly to the input of the telephones amplifier.

5. An override facility is provided whereby the operator of a station

Iso the station of the output of the station boxes. The overall and station boxes. The station boxes is independent of any selection made at those boxes. The OVERRIDE lamp/switch illuminates when the integral switch is operated.

6. In the event of the failure of either of the amplifiers, selection of the NORMAL/EMERGY. switch to EMERGY. operates a relay in the station box. The microphone output is fed direct to the T/R selector switch, as in the transmit condition, and via the modulator and sidetone circuits of the T/R unit selected to the other station boxes via the receiver output connections. To obtain reception of this emergency intercomm. signal, the other station boxes must select reception of the T/R unit selected for reception by this box are fed in parallel, by-passing their individual volume controls, direct to the telephones connected to the box. This will result in crosstalk between the services selected so that if, for example, the box set to EMERGY. has U.H.F. 1 or 2 and Tacan selected, other boxes selecting U.H.F. 1 or 2 will receive Tacan also.

#### Ground crew amplifier

7. The inputs from the four intercomm. points in the fuselage are fed in parallel to the UA6070 ground crew amplifier, mounted on the starboard wall of the cabin between frames 6 and 7 just below the distribution box. The amplifier unit contains two transistorized amplifiers, one for microphone inputs and the other for telephone outputs. These inputs pass into the microphone amplifier, via the contacts of a relay mounted in J.B.14, when it is energized by the selection of the GROUND/FLIGHT switch to GROUND. When the GROUND CREW AMPL'R OFF/ON switch is set to ON, a relay is energized and its contacts connect the microphone amplifier output in parallel with the intercomm. microphone amplifier outputs from the station boxes. These latter outputs are also fed via a transformer in the distribution box and the ground crew telephone amplifier to the telephone terminals of the fuselage intercomm. sockets, again via the relay in J.B.14.

#### Junction box

8. The distribution box, UA6147/1, provides the interconnections between the various T/R units, receivers, station boxes, ground crew amplifiers, fuselage intercomm. sockets and the Sylvania comms system (A.R.I. 23362/0). It contains a filter for the 28V d. c. intercomm. power supply, the override relay, a matching transformer for the intercomm. microphone amplifier outputs and a terminating resistor for each receiver output. Connections are made by means of Cannon plugs and sockets.

#### Press-to-transmit switches

9. The pilot's press-to-transmit switch is mounted on the right-hand grip of the control column and the navigator's switch is mounted on the forward end of the side table adjacent to his station box. The A.E.O. is provided with two switches, one switch is located on the navigator's coaming panel outboard of the A.E.O.'s station box and the other is a foot-operated switch located on the step forward of the A.E.O.'s position. Either switch may be switched in circuit depending upon the position of the HAND-FOOT-JAM switch mounted on the navigator's lower panel assembly. Operation of these switches affects transmission by whichever T/R unit is selected by the TRANS & REC switch on the station box. Microphone signals are fed into the intercomm. system with the switch in the normal (un-operated) position.

#### Davall recorder

10. An audio recording system (A.R.I. 23208) comprising the Davall recorder and interface unit, provides automatic recording and replay facilities of the communication system. The recorder is mounted on the navigator's centre pedestal whilst the interface unit is mounted below the A.E.O.'s switch panel.

#### **Radio Relay Link**

11. The Intercomm. system may be used in conjunction with the A.R.I. 23362/0 comms. jammer system (Sect. 9, Chap. 4, Supplement) as a radio relay link. The link is usually between two external transmitting sources which are outside transmission range. With U.H.F.2 selected and the A.E.O.'s COMMS JAM switch set to UHF2 the signals received by the U.H.F.2 (Sect.8, Chap.4, Supplement) are re-transmitted (on a different frequency) by the comms. jammer system. Indication of this link facility is made via the LINK warning lamps at the pilot's and navigator's stations. The warning lamps illuminate when the A.E.O. has selected LINK.

#### Power supplies

12. The installation is powered by a 28V d. c. supply. The main supply is fed from busbar PP8 via fuse No. 174 and the I/COMM. MASTER switch on the navigator's instrument panel to the intercomm. distribution box. This supply also feeds the ground crew amplifier via its own switch. The relay which isolates the fuselage mic/tel socket connections is supplied from PP8 via fuse No. 176 and the ground crew isolating switch which is labelled GROUND/FLIGHT. The Davall recorder and interface unit are both supplied with 28 volts d. c. from busbar PP7 via fuse 171.

#### SERVICING

#### WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

#### General

13. Components and cables should be checked periodically for damage. General Servicing is straightforward and the removal and assembly of equipment should not present undue difficulties. Servicing information on the equipment is contained in A.P. 116N-0101 series.

14. A.E.O.'s foot operated press-to-transmit switch (26NA/19371). The following instruction must be carried out before installing a new foot-operated switch:

(1) Ensure that the foot-operated switch cables are 40 centimetres in length maximum. Cut to length as necessary.

(2) Sleeve the foot-operated switch cables using sleeve tubing, protective, (5F/9143294).

►





EG7-82-5217

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### FIG. 1. UA60 INTERCOMM. (A.R.I. 23099 AND A.R.I. 23208) INSTALLATION

continued . . .

### TABLE 1 Connector details

CONNECT	OR UA60 No. 1 E	G7.82.607	CONNECTO	DR UA60 No. 5C	EG7.82.617
TERMINATION	CABLE	TERMINATION	TERMINATION PIN	CABLE	PIN TERMINATION
Distribution box	X176180	Pilot's station box	Pressure A	NMS20	Mic +
UA60 No. 1		UA60 No. 1	bulkhead JB	NMS20	Aic – Mic/tel
			UK-AN plug C	N20	Tel + socket
			UA60 No. 5C 🛛 🖉 D	N20	Tel ≻T.B. fwd.
CONNECT	OR UA60 No. 2 E	G7.82.609	Mic/tel Mic. +	1	Earth frame 19
TERMINATION	CABLE	TERMINATION	socket (Screer	ning)	UA60 No. 5C
Pilot's station box	X176180	Nav.'s station box	T.B. forward $\Upsilon$ Mic. –	1	Earth )
UA60 No. 2		UA60 No. 2	frame 19 (Screer UA60 No. 5C	ing)	5
CONNECT	OR UA60 No. 3 E	G7.82.611			
TERMINATION	CABLE	TERMINATION	CONNECT	OR UA60 No. 9	EG7.82.625
Nav.'s station box	X176180	A.E.O.'s station box	TERMINATION	CABLE	TERMINATION
UA60 No. 3		UA60 No. 3	Distribution box	X1731222	Ground crew
			UA60 No. 9		amplifier
					UA60 No. 9
CONNECT	OR UA60 No. 4 E	G7.82.613			
TERMINATION	CABLE	TERMINATION			
A.E.O.'s station box	X176180	Distribution box	CONNECT	OR UA60 No. 10	EG7.82.627
UA60 No. 4		UA60 No. 4	TERMINATION PIN	CABLE	PIN TERMINATION
			Mic/tel Mic –	NMS20	Nic
			socket T.B. J Mic +	NMS20	Mic + External
CONNECT	OR UA60 No. 5 E	G7.82.615	UA60 No. 10 Tel	N20	Tel   I/C connector
TERMINATION PIN	CABLE P	IN TERMINATION	L Tel +	N20	Tel + ≻T.B.
Distribution (A	N20	c)	External I/C Mic –		Earth stbd.
box C	NMS20	B	connector 🚽 (Screenin	g)	wheel bay
Cannon socket 🛛 🖌 D	N20	J	T.B. stbd. Mic +		Earth J UA60 No. 10
UA60 No. 5 E	NMS20	A JB14-UK-AN	wheel bay (Screenin	g)	
LE	N20	D > plug 10-way	UA60 No. 10		
Pressure CA	NMS20	E UA60 No. 5A			
bulkhead B	NMS20	F			
UK-AN fixed socket 🥇 C	N20	G			
UA60 No. 5B D	N20	нЈ			
		-	÷.		

### TABLE 1 Connector details - (continued)

CONNECTOR L	JA60 No. 11 EG7.82.629		CONNECTOR UA60 No.13 EG7.82.5523 (						
TERMINATION PIN C	CABLE PIN TERMI	NATION	TERMINATION	PIN	CABLE	PIN	TERMINATION		
External I/C connector T.B. stbd.	NMS20 Mic – NMS20 Mic + N20 Tel – Mic/te	ł	Nav's coaming panel T.B. UA60 No.13A	R/T	MN22	с <	A.E.O. step, plug break UA60 No.13B		
wheel bay CTel +	N20 Tel + socket	aft.	CONN	IECTOR	UA60 No.	14 EG7.8	82.3027		
UA60 No. 11	≻ т.в.	and the second	TERMINATION	PIN	CABLE	PIN	TERMINATION		
Mic/tel Earth	Mic – UA60	No. 11	A.E.O. step plug (	с	MN20	3)	A.E.O. foot-operated		
socket aft T.B.	(Screening)		break	В	MN20	2 >	press-to-transmit		
UA60 No. 11 Earth	Mic +		UA60 No. 14	А	MN20	1	switch T.B.		
	(Screening)						UA60 No. 14A		
CONNECTOR	1460 No. 12 EC7 92 631		CONN	ECTOR	UA60 No. 1	15 EG7.8	82.5525		
	CARLE PIN TERMI	NATION	TERMINATION	PIN	CABLE	PIN	TERMINATION		
Mic/tel (Mic - 1		NATION	UA60 6147/1	( A	NMS20	3 ]			
socket Mic +	MMS20 Mic +		Intercomm.	јв	NMS20	4 (	T.B. 3668/1		
Aft T B Tel _			distribution box	) So	reens earthe	dat	UA60 No. 15		
	N20 Tel + Mic/te	Isocket	Free connector PL12	L	E15	J			
C Mic -	Earth UIA60	No 12	UA60 No. 15						
Mic/tel socket (Screening		140, 12							
UA60 No 12 $\rightarrow$ Mic +	Earth		CONN	ECTOR	UA60 No. 1	16 EG7.8	32.5527		
(Screening	a)		TERMINATION	PIN	CABLE	PIN	TERMINATION		
Ciosiceini	97			( A		A)			
			UA6042 No. 1	В		В	UA6147/1 intercomm.		
CONNECTOR U	A60 No. 13 EG7 82 5523		distribution box	С		cι	distribution box		
TERMINATION PIN (	CABLE PIN TERMI	NATION	Cannon connector	D		D	Cannon connector		
(1	MN22 A A.E.O. ster		PL3 UA60 No. 16	E		E	PL2 UA60 No. 16		
6	MN22 B / break UA6	0 No. 13B		F		FJ			
	(A.E.O. stat	tion box via							
2	MN22 28V-≺ Nav.'s coar	ning panel	CONN	ECTOR	UA60 No. 1	7 EG7.8	32.5529		
Hand-foot-iam	T.B. UA60	No. 13A	TERMINATION	PIN	CABLE	PIN	TERMINATION		
switch	(A,E,O, pre	ss-to-		( A		AJ			
UA60 No. 13 3	MN22 2 $\prec$ transmit sv	vitch	UA6042 No. 2	В		в	UA6147/1 intercomm.		
	UA60 No.	13C	distribution box	с		cl	distribution box		
	(A.E.O. pre	ss-to-	Cannon connector	D		D	Cannon connector		
5	MN22 I/C	vitch T.B.	PL3 UA60 No. 17	E		E	PL6 UA60 No. 17		
	UA60 No.	13A		F		F)			
				-			continued		

#### TABLE 1 Connector details - (continued) .

CON	VECTOR	UA60 No. 1	8 EG7.	82.5531	CONNECTOR UA60 No. 23 EG7.82.5541 - continued							
TERMINATION	PIN	CABLE	PIN	TERMINATION	TERMINATION	PIN	CABLE	PIN	TERMINATION			
	( A		A)		Pilot's link warning 🏒	T1		T1)	omme link warning			
UA6042 No. 2	В		В	UA6147/1 Intercomm.	◀ lamp UA60 No. 23D	ТВЗ		T2 (	ominis nink warning			
distribution box	) c		сЦ	distribution box	Nav's link warning	T1		T1 ("				
Cannon connector	) D		D	Cannon connector	lamp UA60 No. 23F	ТВЗ		T2 )	A00 NO. 230			
PL2 UA60 No. 18	E		E	PL8 UA60 No. 18 🕨								
	( F		FJ									
					CONN	ECTOR	UA60 No.	24 EG7.82.	5535			
					TERMINATION	PIN	CABLE	PIN	TERMINATION			
CON	VECTOR	UA60 No. 1	9 EG7.	82.5533		5	N22	EOLC				
TERMINATION	PIN	CABLE	PIN	TERMINATION		6	N22	EOL7				
	A		A )			7	N22	EOL1				
UA6147/1	В		в	UA6042 No. 1	Pilot's mic/tel	7	N22	EOL2	A.E.O.'s override			
Intercomm.	С		c ?	distribution box	5-way terminal block	7	N22	EOL10	lamp			
distribution box	D		D	Free connector PL2	UA60 No. 24B	8	N22	EOL3	≻ UA60 No. 24			
Free connector PL5	E		ЕŚ	UA60 No. 19		8	N22	EOL4				
UA60 No. 19A	ĹF		CJ-2	Comms jam switch		8	N22	EOL11				
Earth point on Nav.'s	E37		CJ-3	UA60 No. 19B		9	N22	EOL8				
structure. Tag						9	N22	EOL9 J				
UA60 No. 19C						6	N22	E37	Earth stud			
									UA60 No.24A			

### CONNECTOR UA60 No. 23 EG7.82.5541

TERMINATION	PIN	CABLE PI	N TERMINATION	TERMINATION	PIN	CABLE P
◀	(1)	T2 (Mic +	A.E.O.'s mic/tel		$\int 1$	T1 (N
	5	T5 (Tel-	) socket T.B.		13	T3 (T
	9	T3 (Mic-	-) ( UA60 No. 23A		9	T2 (N
	13	T4 (Tel +	))	Pilot's station box	5	T4 (T
A.E.O.'s station box	4	1/0	A.E.O.'s press-to-	Cannon free	4	1
Cannon free	10	28v	- > transmit switch T.B.	connector	10	28
connector	11	RT	J UA60 No. 23E	UA60 No. 25	11	F
UA60 No. 23	7	5	A.E.O.'s station		12	
	12	6	∫ override lamp T.B.		(7)	
			UA60 No. 23B	Pilot's dimmer (LL71	) 1	~
	6	T1	Comms. link warning	switch, tag	J	
	L 15	T2	∫ lamp T.B	UA60 No. 25D		
			UA60 No. 23C			

### CONNECTOR UA60 No. 25 EG7.82.5543

TERMINATION	PIN	CABLE	PIN	TERMINATION
	$\int 1$		T1 (Mic+)	Pilot's mic/tel
	13		T3 (Tel+)	socket T.B.
	9		T2 (Mic)	UA60 No. 25A
ot's station box	5		T4 (Tel-)	)
nnon free 🚽 🥆	4		1/07	Pilot's press-to-
nector	10		28v->	transmit switch T.B.
60 No. 25	11		RT∫	UA60 No. 25B
	12		2)	
	(7)			Pilot's override
ot's dimmer (LL71	) 1 }	-	1 (	lamp T.B.
itch, tag	J		J	UA60 No. 25C
60 No. 25D				

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continued . . .

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CONN	VECTOR	UA60 No.	26 EG7.8	2.5537	CONNECTOR UA60 No. 28 EG7.82.5539 - continued
TERMINATION	PIN	CABLE	PIN	TERMINATION	TERMINATION PIN CABLE PIN TERMINATION
	5	N22	E35	Earth stud	Nav.'s override lamp ( 4 N22 11 ) Nav.'s override lamp
				UA60 No. 26A	terminal block N22 8 UA60 No. 28
	1	N22	C )		UA60 No. 28B うちく N22 9
	7	N22	7		N22 E36 Earth stud
Pilot's override lamp		N22	1		UA60 No. 28A
5-way terminal block	3 3	N22	10	Pilot's override Jamp	
		N22			
UA00 NO. 200	2	N22	2	0A00 NO. 20	CONNECTOR LIAGONA 20 ECT 82 EGEE
	Ι., Ι	NZZ	3		
	ר 4	N22	4		TERMINATION PIN CABLE PIN TERMINATION
	1		11		Intercomm, master 2 MIN20 H4
◀	5 -	N22	8		switch (Nav.'s lower 3 3 MN20 R41 Radio fuse and
	$( \cdot )$	N22	9 )		panel) UA60 No.29 C relay box
				1 N L - K - A	Tone and mute UA60 No.29
					switch (Nav.'s T3 MN20 E25
CONN	IECTOR	UA60 No.	27 EG7.8	2.5545	lower panel)
TERMINATION	PIN	CABLE	PIN	TERMINATION	UA60 No.29
	(1		Mic +	Nav.'s mic/tel socket	
	5		Tel (	T.B.	
Nav.'s station box	9		Mic –	UA60 No, 27A	
Cannon free	13		Tel +		CONNECTOR UA60 No. 30 EG7.82.5725
connector	4	Т1	(I/C) )	Nav.'s press-to-	TERMINATION PIN CABLE PIN TERMINATION
UA60 No. 27	10	Τ2	(28y-)	transmit switch	Davall recorder $(A  10 \sum T.B. (Nav.'s vertical)$
01100110.27	11	T3	(RT)	UA60 No. 27B	Free connector SK.1 C 10 ∫ wall) UA60 No. 30C
	7	13	T1 )	Nav 's override lamp	UA60 No. 30 B A
	12		T2		Pins B, Fand H 🚽 F 🛛 🗧 🖌 F
			12 )	1.D. 0/00 NO. 2/C	✓ screens connected to H B
					pins E, G and U, all E
0010	FOTOD			0.5500	earthed at E25 $G \rightarrow E$ Davall interface unit.
TERMINATION	ECTOR	UABU NO.	28 EG7.8	2.5539	U Free connector SK 2
TERMINATION	PIN	CABLE	PIN	TERMINATION	T B (Nav 's vertical UA60 No. 30A
	$\begin{bmatrix} 1 \end{bmatrix}$	N22	C		wall) LIA60 No. 30C 10 D
	2	N22	7		A = O (c) prost to tact = 3 O (c)
Nav.'s override lamp		N22	1 (	Nav.'s override lamp	
terminal block 🗸	( 3 √	N22	2 (	UA60 No. 28	
UA60 No. 28B		N22	10		I.B. (IVAV.'S VERTICAL TO FUSE E.C.P.
		N22	3		wall) 171 UA60 No. 30D
	L⁴ 1	N22	4)		
					continued

TABLE 1 Connector details - (continued)

#### CONNECTOR UA60 No. 33 EG7.82.5723 CONNECTOR UA60 No. 31 EG7.82.5719 PIN CABLE PIN TERMINATION TERMINATION PIN TERMINATION TERMINATION PIN CABLE 3 А Marker 'RX' backplate Mic + A.E.O.'s mic/tel A.E.O.'s 5-way Α 5 c J J.B. Connector No. 1 Davall interface unit. F Mic socket T.B. terminal block UA60 No. 33 UA60 No. 33 Free connector SK.3 D Tel + UA60 No. 31A UA60 No. 31 С 5 A.E.O.'s 5-way Е 1 terminal block A.E.O.'s mic/tel Tel – 5 UA60 No. 31B socket T.B. UA60 No. 31A

#### CONNECTOR UA60 No. 32 EG7.82.5721

TERMINATION	PIN	CABLE	PIN	TERMINATION
UA6147/1	( A		1)	A.E.O.'s 5-way
Intercomm,	В		5 >	terminal block
distribution box. ≺	Ϋ́		J	UA60 No. 32
Connector PL10				
UA60 No. 32	L			

### TABLE 2 Cable assembly details

CABLE ASSEMBLY RT20 EG7.82.5651							
TERMINATION	PIN	CABLE	PIN	TERMINATION			
Pilot's mic/tel	Mic +		Mic +	Pilot's mic/tel			
socket type 359	) Mic –		Mic -	socket T.B.			
RT20	Tel +		Tel +	RT20			
	Tel -		Tel — ノ				

#### F.S./5



FIG. 2. UA60 INTERCOMM. (A.R.I. 23099 AND A.R.I. 23208 ) INSTALLATION - BLOCK DIAGRAM.

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NOTE ... Combined theoretical/routeing diagrams for this installation are contained in A.P.101B-0417-10 (Servicing Diagrams Manual).

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FIG. 1. H.F. RADIO A.R.I. 23090/2 INSTALLATION

#### DESCRIPTION

#### General

1. Communication in the H.F. (2 to 25 MHz) band is achieved by a Collins 618T-3 (A.R.I. 23090/2) installation. This provides amplitude-modulated radio-telephony communication on any one of 28,000 channels spaced 1 kHz apart using either a carrier-plus-upper-sideband mode, which is compatible with conventional A.M. communication, or a single-sideband (s.s.b.) suppressed-carrier mode, using the upper or the lower sideband. International standard practice is to use only the upper sideband for s.s.b. working. Detailed information on the equipment and the theory of s.s.b. operation is given in A.P. 116D-0102-1A.

2. The installation utilizes a Chelton long-wire aerial mounted on two stand-off insulating masts and terminating in a tension unit attached to the fin. Aerial tuning is achieved by a Type 180L-3A aerial tuning unit. Control of the operation and frequency selection is performed by a Type 714E-3 control unit.

3. Interconnections between the units of the installation are made via a distribution box mounted on the aft face of bulkhead B, to starboard of the aircraft centre line.

#### T/R unit

4. The T/R unit is a Collins transmitter/receiver 618T-3, also known as radio transmitter/receiver Type M15 (Ref. No. 10D/23518). It is mounted on a resilient mounting tray (Ref. No. 5340-99-945-1643) located on the port side of the aircraft, between frames 1 and B. The unit has a self-contained power supply unit which is fed from the 28V d.c. and 115V 400 Hz single-phase a.c. busbars. The output of the transmitter is 125W carrier power on A.M. and 400W p.e.p. (peak-envelope-power) on s.s.b. transmission. The T/R unit is also capable of c.w. and data transmission but these facilities are not used in this particular installation. Aerial connections are carried on the front panel of the unit; all the other connections are brought out through a 60-pole Cannon plug which mates with a 60-way socket fitted to the mounting tray.

#### **Control unit**

5. The control unit is a Collins Type 714E-3, also known as transmitter/ receiver control Type M53 (Ref. No. 10L/16857). This unit contains

switches for the selection of mode and frequency of operation and an R.F. gain control. The frequency selected is indicated on a digital display on the front panel. The unit is located in the navigator's centre pedestal. The other two crew members may receive the 11.F. communications by selecting H.F. on their station boxes or use transmission and reception, on a frequency set up by the navigator, by setting their TRANS & REC selector to H.F. Selecting 11.F./U.H.F. provides simultaneous operation on both bands.

#### **Pre-amplifier**

6. A Type UA6002 microphone pre-amplifier, is mounted just above the junction box. It raises the level of the output of the intercomm. station box microphone amplifier to that required for the input to the modulator of the T/R unit.

#### Aerial

7. The aerial comprises a single length of wire which is mounted above the fuselage and extends from an aerial mast on the port side of the front fuselage to an anchorage on the leading edge of the fin, via an aerial tensioner unit. A stand-off aerial support mast ensures clearance between the aerial and canopy in the case of jettison. A spark gap is located adjacent to the base of the front aerial mast inside the fuselage. The purpose of the spark gap is to dissipate high radio frequency (R.F.) voltages and lightning strikes, thus preventing damage to the H.F. system.

#### Aerial tuning

8. Tuning of the aerial to match the output of the T/R unit is carried out automatically by a Type 180L-3A antenna tuner (also known as radio frequency tuner Type M5, Ref. No. 10D/23525). The tuner is mounted on a resilient mounting tray (Ref. No. 5340-99-945-1644) located above the T/R unit. All the connections to the unit are brought out on the front panel.

9. The tuner operates when a change of frequency has been selected on the control unit. The setting of the selector knobs starts the tuning cycle of the T/R unit which continues for 8 seconds. When the tuned transmitter is keyed, the output from the transmitter initiates the operation

.



MAST UNIT



## FIG. 2. H.F. AERIAL RENEWAL

of the servo-controlled aerial tuning circuits and these continue for 22 seconds until the tuning elements are correctly adjusted. The H.F. TUN-ING INDICATOR lamp is mounted on the navigator's control panel, to the left of the control unit. This lamp is normally extinguished, but while aerial tuning is in progress the lamp is lit.

#### Power supplies

10. The installation derives its 28V d.c. supply from busbar PP7 via fuses No. 169 and 219. The 115V a.c. supply originates at busbar 1XC and is fed via fuse No. 132 to busbar 1XC2 and thence via fuse No. 227 to the H.F. distribution box for distribution to the T/R and aerial tuning units.

#### SERVICING

#### WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

#### General

11. Components and cables should be checked periodically for damage. General servicing is straightforward and the removal and assembly of equipment does not present undue difficulties. Servicing information is given in A.P. 116D-0102-1A.

#### Aerial renewal

**12.** Approximately 55 ft of Chelton aerial wire, Part No. 5503, is required.

(1) Assembly of aerial to mast (*fig. 2*)
(a) Strip 4½ in. of insulation from the aerial wire.

(b) Remove the chuck cap and ball socket cap from the mast unit and assemble on the wire.

(c) Lift the 5/16 in. long securing pin locking the chuck unit, and unscrew the chuck unit counterclockwise from the mast.

(d) Pass the stripped aerial wire through the chuck unit in the direction of the assembly to the full extent of  $4\frac{1}{2}$  in.; depress the collet arrangement if necessary to facilitate easier entry of bared aerial wire.

(c) Form the bared aerial wire back over a length of 1 in. and offer the chuck unit to the mast unit screwing clockwise until secure, ensuring that the slots on both mast and chuck units are aligned.

(f) Refit the 5/16 in. long securing pin locking the chuck unit to the mast unit.

(g) Fill the ball socket cap with silicone grease, XG-250; pass over the assembly and refit.

(h) Pass the aerial wire through the ferrule of the stand-off mast prior to assembling to fin anchorage at (2).

(2) Assembly of aerial to fin anchorage

(a) Press the collet against the end of the plunger to free the tail rod from the tension unit; withdraw the tail rod completely and attach it to the fin anchorage. Check that the rod is free to move in both planes.

(b) Replace the tail rod in the tension unit leaving 4 in. of serrations exposed.

(c) Remove the taper chuck cap and pass it over the aerial wire.

(d) Tension the wire and cut opposite the rear end of the chuck ensuring that the tension unit and wire are in line; strip the insulation for  $1\frac{1}{2}$  in.

(e) Remove the tension unit from the tail rod and insert the wire into the chuck unit as far as it will go.

(f) Offer the tension unit to the tail rod, thereby connecting the tension unit to the fin anchorage.

(g) Slide back the knurled sleeve to expose the holes in the tension unit barrel and, by pressing the aerial wire down, insert a 5/16 diameter rod or screwdriver into the rear pair of holes in the barrel, thus locking the plunger in the extended position.

(h) Push the tension unit as far over the tail rod as possible and remove the locking pin to release the plunger. The total plunger extension should now be between 1.75 in. and 1.85 in.

(i) Slide the knurled sleeve over the holes in the tension unit barrel.

(k) Fill the taper chuck cap with silicone grease, XG-250; pass over the assembly and refit, after ensuring that no wire slip has taken place at the chucks.

### TABLE 1

#### Connectors

CONNECTOR H.F.1 EG7.82.187				CONNECTOR H.F.1 EG7.82.187 - continued							
TERMINATION	PIN	CABLE	PIN	TERMINATION	TERMINATION	PIN	CABLE	PIN	TERMINATION		
	(P	N8	HF1C	Ground plug H.F.1C		(U	N22	39			
	A	N22	26			V	N22	40			
	В	N22	9			w	N22	41			
	С	N22	5			X	N22	49			
	D	N22	10			Z	N22	50			
	E	N20	11		H.F. distribution	а	N22	51	Trans/receiver		
	F	N22	7		box plug UK-AN	ζь	N22	52	Cannon socket		
H.F. distribution	G	N22	55	+	9000-28-21P H.F.1B	с	N22	45	DPE-60-336 H.F.1		
box plug UK-AN	ζн.	N22	22			d	N22	46			
9000-32-6P H.F.1A	1.	N28	23			е	N22	47			
	J	N22	8			f	N22	48			
	к	N22	6			g	N22	32			
	L	N20	56			h	N22	33			
	м	N20	27			j	N22	34			
	N	N20	16			k	N22	35			
	0	N20	4			(m	N22	36			
	(s	N20	17	Trans/receiver		-		_			
	( A	N20	3	≻ Cannon socket							
	В	N20	2	DPE-60-336 H.F.1	CO	NNECT	OR H.F.2 E	G7.82.1	189		
	С	N20	1		TERMINATION	1	CABLE		TERMINATION		
	D	N20	15		Aerial tuning unit T	ype	Uniradio	Chel	ton aerial post crown		
	E	N20	14		180L-3A tail end H	.F.2			end tag H.F.2		
	F	N20	13								
	G	N16	12								
H.F. distribution	јн	N22	58		co	NNECT	OR H.F.3 E	G7.82.1	191		
box plug UK-AN	ζı	N22	57		TERMINATION	I	CABLE		TERMINATION		
9000-28-21P H.F.1B	ļк	N22	54		Spark gap H.F.3		N12	Chel	ton aerial post H.F.3		
	L	N22	18								
	м	N22	31								
	N	N22	30								
	Р	N22	25								
	R	N22	59		*						
	S	N22	24								
	LΤ	N22	38						continued		

### **TABLE 1 Connectors** - continued

	CONNEC	TOR H.F.4 EG	67.82.193	3	CONNECTOR H.F.6 EG7.82.5327 - continued								
TERMINATION	PIN	CABLE	PIN	TERMINATION	TERMINATION	PIN	CABLE	PIN	TERMINATION				
Trans/receiver				Aerial tuning unit		F	N22	Р					
Type 618T-3 plug	End A	Uniradio 67	End B	Type 180L-3A	H.F. distribution	E	N22	q	Control unit 714E-3				
Type 82.GB.553.2				plug Type 49195	box UK-AN	) D	N16	r	connector pygmy				
H.F.4				(amphenol) H.F.4	9000-32-7S socket	) c	N22	d	Type PTO8SE				
					assembly H.F.6	В	N22	e	H.F.6				
						LA	N16	m j					

#### DIN CARLE DIN TERMINATION

PIN

Е

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С

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L

к

TERMINATION

Control unit 714E-3

TERMINATION	PIN	CABLE	PIN	TERMINATION
Trans/receiver	End A	Uniradio 43	End B	Aerial tuning unit
Type 618T-3 H.F.5				Type 180L-3A
				H.F.5

CONNECTOR H.F.6 EG7.82.5327

CABLE

N22

N22

N22

N22

N22

N22

N22

N22

N22

PIN

i

h

g f

e d

С

ь

а

TERMINATION

H.F. distribution

box UK-AN 9000-32-7S socket assembly H.F.6

CONNECTOR H.F.5 EG7.82.195

#### CONNECTOR H.F.7 EG7.82.591

TERMINATION	PIN	CABLE	PIN	TERMINATION
	( M	N22	10	)
	L	N22	7	
	к	N22	12	
	J	N22	4	
H.F. distribution	н	N20	8	Aerial tuning unit
box socket free ≺	G	N22	14	> Type 180L-3A
UK-AN	F	N20	13	H.F.7
9000-20-295 H.F.7	E	N20	11	
	D	N22	2	
	С	N22	9	
	В	N22	3	
	A	N18	15	
	-		)	

ζz	N22	т	connector pygmy	CONNECTOR H.F.8 EG7.82.593								
Y	N22	S	Type PTO8SE	TERMINATION CABLE TERMINATION								
X	N22	R	H.F.6	H.F. distribution box N22 Intercomm, J.B. socket								
w	N22	Р		UK-AN 9000-16-1P H.F.8 H.F.8								
N	N22	J										
M	N22	н										
L	N22	G		CONNECTOR H.F.9 EG7.82.595								
K	N22	F		TERMINATION PIN CABLE PIN IDENT TERMINATION								
J	N22	i		Pre-amplifier Mic + 19/0076 A Yellow H.F. distribution								
1	N22	u		H.F.9 Mic – 19/0076 B Green box H.F.9								
н	N22	v		Tel + 19/0076 C Red								
CG	N22	z	)	continued								

### **TABLE 1 Connectors** - continued

C	ONNECTO	DR H.F.10	EG7.82.59	7	CONNECTOR H.F.11 EG7.82.2433							
TERMINATION	PIN	CABLE	PIN	TERMINATION	TERMINATION	PIN	CABLE	PIN	TERMINATION			
	( A	N22	TL DC +	In line splice to	In line splice to	TL DC +	N22	1	Tuning light			
H.F. distribution	J			H.F.11	cable H.F.10	E25	N22	8				
box plug H.F.10	1 I											
	В	N22	LLL11	Termination block								
				QR. tags Nav's								
				panel H.F.10								

.

### Chapter 4 U.H.F. RADIO (A.R.I. 23301)

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Note...Combined theoretical/routeing diagrams for this installation are contained in A.P. 101B-0417-10 (Servicing Diagrams Manual).

1	IK	RF	ST	R	CT	ΈD
•					-	

General
Transmitter /receiver units
Control units
Interface units
Interconnecting boxes
Aerials
Intercomm. station boxes
Radio relav link

DESCRIPTION

Para.



**ANNOTATIONS AMENDED**►
UK RESTRICTED

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#### DESCRIPTION

#### General

1. Communications in the U.H.F. range are provided by two A.R.I. 23301 installations referred to as U.H.F.1 and U.H.F.2. The locations of the main items are shown in fig. 1. Connector and cable assembly details are given in Table 2.

#### Transmitter/receiver units

■ 2. Two transmitter/receiver units, Type PTR1751WW are fitted in the aircraft. The U.H.F.1 unit is mounted on a tray located beneath the floor at the A.E.O.'s station and is supplied with 28-volts d.c. derived from busbar PP7 via fuse 218 in the E.C.P. The U.H.F.2 unit is mounted on a tray located in the upper equipment compartment and is supplied with 28-volts d.c. derived from busbar P10 via fuse 13 on the M.E.P. Provision is made for the automatic or manual selection of frequencies within the range 220 MHz to 399.95 MHz. Using automatic selection 16 preset frequencies, plus the guard frequency are available. Using manual selection 3500 frequency channels spaced 50 KHz apart or 7000 frequency channels spaced 25 KHz apart are available.

#### **Control units**

**3.** Two Type PV1754Wcontrol units are fitted in the aircraft, U.H.F.1 on the pilot's miscellaneous instrument panel and the U.H.F.2 above the E.C.P. to the right of the navigator's table. The U.H.F.1 PRESS-TO-MUTE and TONE switches, together with the UHF 1 LOWER UHF 2 UPPER/UHF 1 UPPER UHF 2 LOWER aerial changeover switch are situated above the U.H.F.1 control unit, also on the miscellaneous instrument panel. The MUTE and TONE switches for the U.H.F.2 system are located on the navigator's control panel – starboard.

4. Each control unit provides the following facilities:-

(1) Selection of any one of 16 pre-set channels is effected by a rotary switch idented 1 to 16.

(2) Manual frequency selection is effected by two rotary switches, the left-hand switch controlling 100, 10 and 1 MHz selections and the right-hand switch controlling 100 and 25 KHz selections enabling any one of 3500 manually-selected frequencies to be set.

(3) A digital display shows the frequency set in (2) above.

(4) A function switch idented OFF/TR/TR+G/TR+H/TR+G+H controls power to the associated installation. The switch has five positions as follows:-

- (a) OFF power supplies disconnected.
- (b) TR power applied for normal transmitter/receiver operation.
- (c) TR+G power applied for normal transmitter/receiver operation and to its guard receiver.
- (d) TR+H and TR+G+H provide similar facilities to (b) and (c) and to homing equipment not used in this installation.

(5) A mode switch idented Gu/Gv/P/M determines the mode of operation of the installation; when set to Gu, operation is at the guard frequency while at P and M, the installation operates at the pre-set and manually-selected frequencies respectively. Gv is not used in this installation.

(6) A SET CHANNEL button inserts the manually-selected frequency into the selected pre-set channel. The button can only be operated when rotated against spring tension.

(7) A TEST button controls the built-in test facility to check transmitter/receiver and display serviceability; with the button operated, the display shows the first five digits of the frequency set by the mode switch at P or Gu. With the mode switch set to M, the display shows 888.88.

(8) VOL and DIM controls adjust the volume of the transmitter/receiver audio output and the display intensity respectively. Panel lighting is controlled by dimmer switches at the crew's stations.

System facilities are available to crew members by making the appropriate selection on their intercomm. station boxes.

#### Interface units

5. An interface unit is fitted on each of the transmitter/receiver moun-

ting trays. Their purpose is to match the transmitter/receiver operating parameters with those of the intercomm. installation.

#### Interconnecting boxes

6. Two Type 5821-99-932-6361 interconnecting boxes are fitted in the aircraft. The U.H.F. 1 box is mounted on a bracket on the starboard side of the cabin between frames 4 and 5. The U.H.F. 2 box is mounted at the rear of the pressure bulkhead in the upper equipment compartment. The boxes carry six multi-pole connectors which provide electrical connections to the various units and a test socket while a muting plug is connected to a seventh connector.

#### Aerials

7. Two Type 5985-99-911-8266 aerials are fitted to the aircraft; the upper aerial is mounted on the centre line of the upper fuselage between frames 29 and 30 and the lower aerial is mounted on the underside of the fuselage between frames 12 and 13 slightly to starboard of the centre line. Selection of the required aerial is made by UHF 1 LOWER UHF 2 UPPER/UHF 1 UPPER UHF 2 LOWER switch mounted on the pilot's miscellaneous instrument panel. Operation of the switch controls an assembly of four aerial change-over relays. The aerial change-over relay is mounted at the rear of the pressure bulkhead on the port side.

#### Intercomm. station boxes

8. Each intercomm. station box is modified to bring the Tacan and A.D.F. facilities together in one receive selector button. Individual audio outputs are controlled by the respective gain controls on the Tacan and A.D.F. control units. The intercomm. station box selector button varies both Tacan and A.D.F. audio outputs together. The U.H.F. 2 facility is controlled by the spare push button and the rotary transmit/ receive switch has a U.H.F. 2 position.

#### **Radio Relay Link**

9. The Intercomm. system (Sect. 8, Chap. 1, Supplement) and the A.R.I. 23362/0 comms. jammer system (Sect. 9, Chap. 4, Supplement) can be used together as a radio relay link. The link is usually made bet-

ween one transmitting source and another receiving source normally outside the transmission distance. With U.H.F. 2 selected and the A.E.O.'s COMM. JAM switch set to U.H.F. 2 the signals received by the U.H.F. 2 are re-transmitted (on a different frequency) by the comms. jammer system.

#### SERVICING

#### WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or . performing any operations upon the aircraft.

#### General

10. All components and cables should be checked periodically for damage. General servicing of the equipment is self-evident and detailed servicing information including test equipment will be found in A.P. 116D-0154-1.

#### REMOVAL AND ASSEMBLY

#### Transmitter/receiver units

11. The U.H.F. 1 transmitter/receiver on its mounting tray is located beneath the floor just forward of the A.E.O.'s station. To gain access to the unit it is necessary to remove the floor panel. The removal and assembly of the unit is then self-evident. The U.H.F. 2 transmitter/ receiver on its mounting tray is located in the upper equipment compartment. The removal and assembly of the unit is self-evident.

#### Interface units

12. The interface units contain links and preset controls which must be set up to suit the Canberra T Mk. 17 installation as detailed in A.P. 116D-0154-1 prior to fitment of a replacement unit.

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FIG. 2. U.H.F. 1 AND U.H.F. 2,(A.R.I. 23301) INSTALLATION - BLOCK DIAGRAM.

SYSTEM AMENDED ►
 UK RESTRICTED

### TABLE 1

### Equipment details

	Equipment	Туре	Ref. No.	Location	A.P. Reference
◀	Transmitter/receiver U.H.F.1	- PTR1751WW	5821-99-7667945	A.E.O.'s station, below floor	
	Transmitter/receiver U.H.F.2			Upper equipment compartment	
	Interface unit U.H.F.1	PV1746BB	5821-99-7683993	A.E.O.'s station, below floor	
	Interface unit U.H.F.2			Upper equipment compartment	A.P.116D-0154-1B
	Control unit U.H.F.1	- PV1754W	5821-99-6598964 -	Miscellaneous instrument panel	
	Control unit U.H.F.2		,	_Aft face of E.C.P.	
	Mounting tray (2 off)	PV1748B	5821-99-6499755	A.E.O.'s station, below floor	
	-	,		Upper equipment compartment	
	Interconnecting box U.H.F.1	-	5821-99-9326361	Stbd. fuselage between frames 4 and 5	A P 116D-0105-1
	Interconnecting box U.H.F.2		]	Upper equipment compartment	
	Upper aerial	16 - 1	5985-99-2222399	Upper fuselage between frames 29 and 30	A.P.116D-0133-1
	Lower aerial	]		Underside of fuselage between frames 12 and 13	

continued . . .

### TABLE 2

### **Connector details**

Cable Symbols:- Uniradio = U.R., Equipment wire = Q, Uninyvin = UN, Uninyvinmetsheath = UNMS, Miniature cable = Min.

#### CONNECTOR CS 5411/1

#### CONNECTOR CS 5411/1 - continued

Termination	Pin	Cable	Ident	Pin	Termination	Termination	Pin	Cable	Ident	Pin	Termination
	<b>FA</b>	Q3	1 White	A			L1	Q2	32 Pink	١٦	
	В	Q3	2 White	в			k	Q2	33 Pink	ĸ	
	C	Q2	3 White	c			m	Q2	34 Pink	m	
	D	Q2	4 White	D			n	Q2	35 Pink	n	
	E	Q2	5 White	E		No 2	р	Q2	36 Pink	p	11 11 12 2
	F	Q2	6 White	F		INO.2	q	Q2	37 Pink	q	U.H.F.Z
	н	Q2	7 White	н		interrace	- r	Q2	38 Pink	r  -	her (TP unit)
	J	Q2	8 White	J		unit	s	Q2	39 Pink	s	
	K	Q2	9 White	ĸ			t	Q2	40 Pink	t	
	L	Q2	10 White	L			u	Q2	41 Pink	u	
	м	Q25	11 Pink	м			Lw	Q2	42 Pink	w	
	N	Q25	12 Pink	N							
	P	Q2	13 White	P							
No.2	R	Q25	14 Pink	R							
	S	Q25	15 Pink	S	UHE2						
interface	T	Q2	16 White	T	Interconnecting						
unit	7U	Q2	17 White	υF	box (TR unit)						
	1 V	Q2	18 White	V	box (In diat)						
	W	Q2	19 White	w							
	X	Q25	20 Pink	×							
	Y	Q25	21 Pink	Υ							
	Z	Q25	22 Pink	z							
	a	Q2	23 Pink	a							
	Ь	Q2	24 Pink	ь			C	ONNECTO	OR CS 541	1/3	
	С	Q2	25 Pink	С		Termination	Pin	Cable	Ident	Pin	Termination
	d	Q2	26 Pink	d		101 minusion		Cabio			renniation
	e	Q2	27 Pink	е			vvire	e capital li	dents pin to	pin	
	f	Q2	28 Pink	f			a	Q2		a	
	g	Q2	29 Pink	g		Pressure	ь	Q2		b	U.H.F.2
	h	Q2	30 Pink	h		bulkhead	- 0	Q2		c  -	Control
	Ľ	Q2	31 Pink	<u> </u>		U.H.F.2/1	d	Q2		d	unit
	_						Le	Q2		f	

### TABLE 2 Connector details - continued

#### CONNECTOR CS 5411/3 - continued

Termination	Pin	Cable	Ident	Pin	Termination
Pressure	ſf	Q2		g	U.H.F.2
bulkhead	ζg	Q2		h >	Control
U.H.F.2/1	(h	Q2		1)	unit

### CONNECTOR CS 5411/5

Termination	Pin	Cable	Ident	Pin	Termination
	a	Q3		a)	
	b	Q3		b	
U.H.F.2	с	Q3		с	
Interconnecting	d	Q3		d	Pressure
box ≺	f	Q3		e >	bulkhead
(control unit)	g	03		f	U.H.F.2/1
	h	03		g	
	(I	Q3		ъJ	

### CONNECTOR UHF 2/2 EG7-82-5547

Termination	P	in Cable	Ident Pin	Termination
	ſ	UN20	A	)
	E	3 UN20	В	No. 1 Distribution
Pressure		C UNMS	С	box, plug 1
bulkhead	Ϋ́	UNMS	D	U.H.F.2/2A
U.H.F.2/2	16	UN20	E	)
	F	Braid of C	Eart	n
	10	Braid of D	) rina	

#### **CONNECTOR UHF 2/2** - continued

<b>Fermination</b>	Pin	Cable	Pin	Termination	
Pressure	ſн	UN20	Term 1	Mute switch	U.H.F.
bulkhead	ζı	UN20	Term 2	Tone switch ∫	2/2C
U.H.F.2/2	ĺκ	UN20	T.B. LL 73	TAG, T.B. Nav's	
				coaming panel	
				U.H.F.2/2B	

### CONNECTOR CS 5411/9

Termination	Pin	Cable	Pin	Termination
Intercomm.	A	UN20	Term 3	
junction box	<b>∢ в</b>	UN20	Term 4 🥤	T.B. 3668/1
PL10 (orange/	lc	not used	5	
red)	-			

### CONNECTOR 5411/10

Termination	Pin	Cable	Pin	Termination
U.H.F.2				Aerial change-
Transmitter/		U.R.67		over relay
receiver				SKT D

#### CONNECTOR 5411/11

Termination	Pin	Cable	Pin	Termination
	( A	UN20	A	
	В	UN20	в	U.H.F.2
	c	UNMS	o >	Interconnecting
	D	UNMS	c	box (mic/tel) B1
Pressure	E	UN20	ЕĴ	
bulkhead	רך	Braid	Shell	Interconnecting
U.H.F.2/2	G	Braid	Shell >	box (mic/tel)
	н	UN20	۶J	U.H.F.2
	J	UN20	C \	Interconnecting
	Ĺκ	UN20	A ∫	box (PL & tone) B2
				▶ ◀

#### TABLE 2 Connector details - continued

#### CONNECTOR U.H.F.1 EG.82.957 CONNECTOR U.H.F.4 EG7.82.117 Cable Ident Pin Termination Termination Pin Cable Ident PIn Termination МЗА Red Α U.H.F.1 Ā DEF 12B-3 White Α МЗА Blue в Interconnecting в DEF 12B-3 в White С МЗА Green box PL & tone С С DEF 12B-2 White D DEF 12B-2 White D Е Е DEF 12B-2 White CONNECTOR U.H.F.2 EG7.82.111 F F DEF 12B-2 White н DEF 12B-2 White н Cable Pin Termination J DEF 12B-2 White J 12B-2 U.H.F.1 к DEF 12B-2 κ White Interconnecting box DEF 12B-2 L L White (control unit) M DEF 12B-2S M Pink N DEF 12B-2S Pink Ν P Ρ DEF 12B-2 White CONNECTOR U.H.F.3 EG7.82.113 R 103/202/GY Yellow R S 103/202/GY S Green Cable Townsleadion

Termination	Cable	Termination		S	103/202/GY	Green	S	
			No.1	Т	DEF 12B-2	White	т	U.H.F.1
U.H.F.1	Uniradio 67	Pressure bulkhead	interface	- U	DEF 12B-2	White	υ	-interconnecting
Transmitter/		UKN2 plug	unit	v	DEF 12B-2	White	v	box plug
receiver unit		U.H.F.3		w	DEF 12B-2	White	w	(T.R. unit)

#### CONNECTOR U.H.F.3A EG7.82.115

Termination	Cable	Termination	
Pressure bulkhead plug UKN2 U.H.F.3A	Uniradio 67	Aerial changeover relay 'A' plug UKN2 U.H.F.3A	

DEF 12B-2 White θ DEF 12B-2 White f DEF 12B-2 White g DEF 12B-2 White h DEF 12B-2 White i DEF 12B-2 White i DEF 12B-2 White k DEF 12B-2 White m DEF 12B-2 White n DEF 12B-2 White р

White

White

White

White

а

b

С

d

DEF 12B-2

DEF 12B-2

DEF 12B-2

DEF 12B-2

а

b

С

d

e

g

h

i

k

m

n

D

continued . . .

Termination

Plug break

(miscellaneous

instrument

panel) U.H.F.1

Termination

U.H.F.1

Control unit

(miscellaneous

instrument panel)

PIn

Α

в

l C

Pin

### **TABLE 2 Connector details -** *continued*

### CONNECTOR U.H.F.4 EG7.82.117 - continued

#### CONNECTOR U.H.F.12 EG7.82.5969

Termination	Pin	Cable	Ident	Pin	Termination	T	Dim	Cabla	Ident	т	armination
	(q	DEF 12B-2	White	d J		remination	Fin	Caple	Iucin		emmation
	r	DEF 12B-2	White	r	U.H.F.1	No.1 U.H.F.	A		R6	Т	ags, E.C.P.
No. 1	2 s	DEF 12B-2	White	s	Interconnecting	transmitter/	в		R6	- (	(fuse 218)
interface	) t	DEF 12B-2	White	t	box plug	receiver.	c		R6 (	ι L	J.H.F.12A
unit	uw	DEF 12B-2 DEF 12B-2	White	u w	(T.R. unit)	plug 2	Ĵρ		E25	Т	erminal strip,
	<b>C</b> ."	021 1202		)		U.H.F.12	E		E25	-	E.C.P.

### CONNECTOR U.H.F.6 EG7.82.605

Termination	Cable	Termination
Aerial		Lower
change-over relay	Uniradio 67	aerial plug
U.H.F.6		UKN2 U.H.F.6

#### CONNECTOR U.H.F.7 EG7.82.603

Termination	Cable	Termination
Aerial		Upper aerial
change-over relay	Uniradio 67	plug UKN2
U.H.F.7		U.H.F.7

### CONNECTOR U.H.F.9 EG7. 82.5965

Termination	Ident	Cable	Ident	Termination
Т.В.,	∫ RR31		RR31	Fuse 251, U.H.F.9A
	€G		EG	T.B., U.H.F.9B
U.H.F. equipmer	nt			U.H.F.
panel				equipment
U.H.F.9				panel

#### CONNECTOR U.H.F.10 EG7.82.5967

Termination	Pin	Cable	Ident	Termination
No.2	( A		RR31	)
U.H.F.	В		RR31	2-way T.B., U.H.F.
transmitter/	) c		RR31	equipment
receiver,	) D		EG	panel
plug 2	E		EG	U.H.F. 10A
U.H.F.10	( F		EG	)

No.1 U.H.F.	A	R6	Tags, E.C.P.
transmitter/	В	R6 }	(fuse 218)
receiver,	С	R6 )	U.H.F.12A
plug 2	D	E25	Terminal strip,
U.H.F.12	E	E25 }	E.C.P.
	F	E25	U.H.F.12A

#### **CONNECTOR RT430 EG7.82.121**

Þ

Termination	Pin	Cable	Pin	Termination
Terminal block	P-to-M		P-to-M	3-way T.B.
miscellaneous 🛪	{		>	on U.H.F.
instrument panel	P-to-M		P-to-M J	equipment panel
QR Tag RT 430	NEG		NEG	QR Tag RT430

#### CONNECTOR RT431 EG7.82.5521

Termination	Pin	Cable	Pin	. Termination
	( A	N20	A)	
U.H.F.1	B	N20	в	Intercomm.
Interconnecting	l c	NMS20	c >	junction box
box plug	ЧD	NMS20	D	UA6147/1 socket 3
6-way Mk. 7	E	N20	ЕJ	RT 431
NT 431A	ĹF	N20	P-to-M	3-way T.B. on
			1. SP45	U.H.F. equipment panel BT 431B
			)	111 4010

Note: For details of cables F25, N25, N427, N512 and 2F135 refer to Sect. 6, Chap. 11.

Chapter 5 V.O.R./I.L.S.

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NOTE... Combined theoretical/routeing diagrams for this installation are contained in A.P.101B-0417-10 (Servicing Diagrams Manual).

### UK RESTRICTED

Marker indications

Navigation unit Frequency selection ..... Omni-bearing selector and indicator ..... Marker receiver

DESCRIPTION

### Para.

1

3

4

5

6

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9

10

#### UK RESTRICTED



FIG. 1. V.O.R./I.L.S. A.R.I. 23118 INSTALLATION

UK RESTRICTED

EG7 82 355 10

#### DESCRIPTION

#### General

1. A Marconi A.D. 260 V.O.R./I.L.S. installation (A.R.I. 23118) is fitted. This is a navigation and landing aid using a V.H.F. omni-range system and a V.H.F./U.H.F. instrument landing system. Details of the equipment and a description of the principles of V.O.R. and I.L.S. are given in A.P. 116B-0407-1.

2. The installation consists of a Type 6401-M V.H.F. receiver, a Type 6402-MA navigation unit, a Type 6404 ME glide slope receiver, a Type 7430-M control unit, a Type RL 7003-184B omni bearing selector and deviation indicator, a Type 6403 M marker receiver, and their associated aerials. The V.H.F. and glide slope receivers and the navigation unit are mounted on a Type EJB-21B-1 backplate junction box, located under the navigator's table. The marker receiver is mounted on its Type EJB-21C backplate junction box, located adjacent to the other junction box.

#### V.H.F. receiver

**3**. The V.H.F. receiver's frequency range (from 108 to 135 MHz) covers the V.O.R., I.L.S. and V.H.F. communication channels. Tuning of the receiver is carried out by two automatic tuning mechanisms controlled by the control unit, which also makes the circuit changes in the navigation unit necessary for V.O.R. or I.L.S. operation.

#### Navigation unit

4. This unit receives navigational data from the V.H.F. receiver and processes it in different ways according to the mode of operation selected. In the V.O.R. mode, it receives compass data from the GM4B compass system (Sect.7, Chap.4, Supplement) and provides an output to the pilot's and navigator's radio magnetic indicators (R.M.I.). These give an indication of the magnetic bearing of the V.O.R. transmitter from the aircraft position and the bearing of the V.O.R. transmitter relative to the aircraft heading. In the I.L.S. mode the unit supplies an output to the deviation indicator to give left and right indications or to actuate the OFF flag when these indications become unreliable.

#### Glide slope receiver

5. The glide slope receiver is tuned to the channel appropriate to the LLS. channel selected on the control unit. The operational frequencies

lie between 329.15 MHz and 335 MHz with a channel spacing of 150 kHz. The output from this receiver drives the horizontal (high/low) pointer of the indicator and its associated flag.

#### **Frequency selection**

6. Selection of the frequency of operation of the V.O.R./I.L.S. installation is made on the Type 7430M control unit mounted on the pilot's starboard coaming panel directly beneath the V.H.F. communication control unit. These two control units are identified NAV. and COMM. respectively. The front panel of the control unit carries a combined volume control and on/off switch, and whole and fractional MHz selection switches. The frequency selected is indicated by a digital display.

7. Odd 100 kHz frequency channels in the range 108.1 to 111.9 MHz are allocated to 1.L.S. localizer use. Each of these is 'paired' with a glide slope channel frequency. The even 100 kHz channels up to and including 111.8 MHz and all channels from 112 to 117.95 MHz are allocated for V.O.R. use.

#### Omni-bearing selector and indicator

The omni-bearing selector (O.B.S.) and an indicator is mounted 8. on the flight instrument panel above the R.M.I. The instrument combines the functions of V.O.R. bearing selector and a crossed-pointer deviation indicator. The deviation indicator has a vertical pointer which gives deviation indications in the V.O.R. mode and left and right of localizer beam indications in the I.L.S. mode. The horizontal pointer gives indications of being high or low with respect to the glide slope beam in the I.L.S. mode. Flags are provided for both pointers to show when their indications are unreliable. A TO/FROM indicator is also incorporated; this gives an indication of the direction in which the aircraft is flying with respect to the V.O.R. transmitter whose bearing has been selected using the O.B.S. control knob and shown on the scale of the indicator. The R.M.I., which displays the bearing of the V.O.R. transmitter relative to the aircraft, is also used for a similar purpose in the radio compass system.

#### Marker receiver

**9.** The marker receiver operates on a fixed frequency of 75 MHz and receives signals from ground marker beacons. The power supply is controlled by an ON/OFF switch mounted on the pilot's starboard coaming

panel, just outboard of the V.H.F. COMM. control unit.

#### **Marker indications**

10. Three coloured lights flash when the aircraft passes over the marker beacons. These are situated on the pilot's flying panel, adjacent to the O.B.S. The blue light indicates the outer marker, the amber the middle and the white indicates airways marker or the inner marker if still installed. The sensitivity of the marker receiver may be varied by the operation of a switch adjacent to the three lights, annotated SENS. SWITCH HIGH/ LOW. Audible signals from the marker beacons may be heard by selecting MARKER on the crew's intercomm. station boxes.

#### Aerials

11. Three separate aerials are required for the V.O.R./I.L.S. system. The V.O.R. and I.L.S. localizer signals are received by a pair of Type 140-LRU-A99A V.II.F. aerials, mounted one on each side of the fin. The signals received by these are combined in a Type 133-LRU-14A balance unit, located in the fin and then passed via the backplate junction box to the receiver. A circular area on each side of the fin, centred on the aerial base, is covered in copper gauze bonded to the fin structure to provide a ground plane. These areas are connected to the metal leading edge and the base of the fin by sprayed zinc strips. A removable panel is located to the rear of the port aerial to give access to the aerial connectors and the balance unit.

12. Marker signals are received by a Type 237 marker aerial mounted just outboard of the starboard wheel well. The aerial is tuned to resonate at 75 MHz and provision is made for access to use a trimming tool, Ref. No. 10C/749, for this purpose.

13. The glide slope aerial is a Type 238 suppressed aerial mounted in the leading edge of the starboard main plane, between ribs 6B and 7A.

#### Power supplies

14. The 28V d.c. supplies required for the operation of the V.O.R., 1.L.S. and marker receivers is derived from busbar PP7 via fuse No. 167. The supply to the marker receiver is controlled by the ON/OFF switch on the pilot's starboard coaming panel. The supplies to the junction box for the V.H.F. and glide slope receivers and the navigation unit are switched by a relay in the E.C.P. This relay is controlled by the on/off switch of the VOL. control on the NAV. control unit. One of the contacts on this relay switches the 26V 400 Hz a.c. supply for the synchros in the R.M.I.'s *(Sect. 6, Chap. 4 and 11)*. A test socket for the 28V d.c. supply is located adjacent to the forward upper corner of the cabin entrance door. This socket is energized when the relay contacts are closed *(Sect. 6, Chap. 11)*. This socket also serves as a power source for the V.O.R./I.L.S. test equipment.

#### SERVICING

#### WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

#### General

**15.** Components and cables should be checked periodically for damage. General servicing is straightforward and the removal and assembly of equipment should not present undue difficulties. Servicing information on the equipment is contained in A.P. 116B-0407-1. For repair of I.L.S. aerial covers refer to A.P. 101B-0400-6, Cover 1, Chap. 3, para. 12.

#### Note . . .

If rain erosion effects are such that fibreglass base has been pitted and damaged, then the aerial cover must be wholly replaced.

#### Interconnecting box, Type M7A

16. The following modification must be carried out before installing a new I/C box of this type. At the resistor card inside the box:-

(1) Fit and solder a 1 k-ohm resistor Ref. No. 5905-99-012-8491 at positions R1 and R4.

(2) Fit and solder a 200-ohm resistor Ref. No. 5905-99-012-8474 at position R2.

(3) Fit and solder a 240-ohm resistor Ref. No. 5905-99-012-8476 at position R3.

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UK RESTRICTED

(4) Label the box in a similar manner to the unserviceable item.

### Interconnecting box, Type M8

17. The following modification must be carried out before installing a new I/C box of this type. At the tag board inside the box:-

- (1) Fit and solder a 33-ohm resistor at positions R1, R2 and R3.
- (2) Label the box in a similar manner to the unserviceable item.

### TABLE 1

### Connectors

CONNECT	OR V.C	).R./I.L.S. N	lo. 1 E(	G7.82.1433	CONNEC	TOR V.	D.R./I.L.S. I	No. 2 EC	G7.82.1435
TERMINATION	PIN	CABLE	PIN	TERMINATION	TERMINATION	PIN	CABLE	PIN	TERMINATION
	21	NMS20	A			( c	NMS20	A)	
	34	NMS20	В			E	NMS20	В	Backplate junction
	33	NMS20	С		Radio fuse and	J	NMS20	D	box EJB-21B-1
	23	NMS20	D		relay box UK-AN	L	NMS20	ΕĹ	Cannon plug
	2	NMS20	Е	Radio fuse and relay	socket	ζA	NMS20	н (	socket 5
	1	NMS20	F	box.	V.O.R./I.L.S.2	G	NMS20	J	V.O.R./I.L.S. 2A
	3	N20	G	UK-AN socket		N	N20	к	
	25	N20	н	V.O.R./I.L.S. 1A		Р	N20	гJ	
Backplate junction	27	N20	J			Н	NMS20	ΑĴ	Master indicator CL
box EJB-21B-1	32	N20	к			(s	N20	В	Type 'E' G4B Mk. 7
Cannon plug 🛛 ≺	28	N20	L			к	NMS20	c >	≻ plug
socket 3	29	N20	мЈ		Radio fuse and	R	N20	D	V.O.R./I.L.S. 2B
V.O.R./I.L.S.1	17	NMS20	A )		relay box UK-AN	) M	NMS20	ЕĴ	
	10	NMS20	В		socket	ήв	NMS20	AJ	Master indicator CL
	18	NMS20	С	O.B.S. and deviation	V.O.R./I.L.S.2	U	N20	в	Type 'E' G4B Mk. 7
	13	NMS20	D (	indicator		D	NMS20	c >	≻ plug
	14	NMS20	E	Cannon socket		Т	N20	D	V.O.R./I.L.S. 2C
	15	NMS20	F	V.O.R./I.L.S. 1B		( F	NMS20	ЕĴ	
	16	NMS20	G			-		-	
	20	N20	т						
(	19	N20	υJ		CONNEC	TOR V.C	).R./I.L.S. N	lo. 3 EG	67.82.1437
1	<pre>N</pre>	N20	c )	Backplate junction	TERMINATION	PIN	CABLE	PIN	TERMINATION
	Р	N20	D	box EJB-21B-1		ſн	N20	1)	Radio magnetic
O.B.S. and deviation	J	N20	E	Cannon plug		A	NMS20	2	indicator
indicator	к	N20	F	≻ socket 4		C C	NMS20	3	(navs)
Cannon socket	М	N20	н	V.O.R./I.L.S. 1C		G	N20	4	Cannon plug
V.O.R./I.L.S. 1B	L	N20	J		Radio fuse and	В	NMS20	5	V.O.R./I.L.S. 3A
	R	N20	к		relay box UK-AN	ζı	N20	1)	
l	S	N20	ъJ		plug V.O.R./I.L.S.3	D	NMS20	2	Radio magnetic
						F	NMS20	3 (	indicator (navs)
						ĸ	N20	4	Cannon plug
						E	NMS20	5	V.O.R./I.L.S. 3B
						L	N20	6 )	

continued . . .

### **TABLE 1 Connectors** - continued

CONNECT	OR V.	0.R./I.L.S. N	lo. 4 E C	G7.82.1439
TERMINATION	PIN	CABLE	PIN	TERMINATION
	ГН	N20	1)	Radio magnetic
	Α	NMS20	2	indicator (pilot's)
	С	NMS20	3	Cannon plug
	G	N20	4	V.O.R./I.L.S. 4A
Radio fuse and	в	NMS20	5 )	
relay box UK-AN 🛛 🔾	J	N20	1 ]	
plug V.O.R./I.L.S.4	D	NMS20	2	Radio magnetic
	F	NMS20	3	indicator (pilot's)
	к	N20	4	Cannon plug
	E	NMS20	5	V.O.R./I.L.S. 4B
	L	N20	6 )	

### CONNECTOR V.O.R./I.L.S. No. 5 EG7.82.5513

TERMINATION	PIN	CABLE	PIN	TERMINATION
	$\int 1$	N20	1)	
	2	N20	2	
	3	N20	3	
	4	N20	4	
	5	N20	5	
	6	N20	6	
	7	N20	7	
Backplate	8	N20	8	Navigation
junction box	10	N20	10	control unit
EJB-21B-1	2 11	N20	11	Type 7430M
Cannon plug	12	N20	12	Cannon socket
socket 2	14	N20	14	V.O.R./I.L.S. 5A
V.O.R./I.L.S.5	15	N20	15	
	27	N20	27	
	28	N20	28	
	29	N20	29	
	33	N20	33	
	34	N20	34	
	35	N20	35	
	36	N20	36	
	37	N20	37	
	~			

CONNECTOR V.O.R./I.L.S. No. 5 EG7.82,5513 - continued													
TERMINATION	PIN	CABLE	PIN	TERMINATION									
	( 38	N20	38 )										
Backplate	39	N20	39	Navigation									
junction box	41	N20	41	control unit									
EJB-21B-1	42	N20	42	Type 7430M									
Cannon plug	] 43	N20	43 (	Cannon socket									
socket 2	44			V.O.R./I.L.S. 5A									
V.O.R./I.L.S.5	47	f N20											
	48	N20	48										
	49	N20	49										

### CONNECTOR V.O.R./I.L.S. No. 6 EG7.82.5515

TERMINATION	PIN	CABLE	PIN	TERMINATION
Backplate junction	(		)	Intercomm.
box EJB-21B-1	ЈВ	NMS20	AL	distribution box
Cannon socket 1	JС	NMS20	в (	UA6147/1
V.O.R./I.L.S.6	L		J	Plug 11
				V.O.R./I.L.S.6

#### ......

### CONNECTOR V.O.R./I.L.S. No. 8 EG7.82.1447

TERMINATION	PIN	CABLE	PIN	TERMINATION
	( A	N20	Com	)
	В	N20	BL-L	
Marker backplate	С	N20	AM-L	
junction box	D	N20	WH-L	Pilot's flying panel
Type EJB-21C	ίE	NMS20	MED	quick-release tags
Cannon plug socket 2	F	NMS20	SEN-E	V.O.R./I.L.S.8
V.O.R./I.L.S.8	н	N20	E25	
	J	NMS20	SEN-HI	
	Ĺк	N20	TEST	

#### **TABLE 1 Connectors** - continued

#### CONNECTOR V.O.R./I.L.S. No. 9 EG7.82.1449

CABLE

coaxial

TERMINATION

Backplate junction box Type EJB-21B-1 Cannon plug socket 7 V.O.R./I.L.S.9

TERMINATION Pressure bulkhead free socket V.O.R./I.L.S.9

#### CONNECTOR V.O.R./I.L.S. No. 11A EG7.82.895 TERMINATION CABLE

coaxial

Pressure bulkhead free socket V.O.R./I.L.S. 11A

TERMINATION Frame 29 bulkhead free socket V.O.R./I.L.S. 11A

#### CONNECTOR V.O.R./I.L.S. 11B EG7.82.896

CONNECTOR	V.O.R./I.L.S. No	o. 9A EG7.82.900	TERMINATION	CABLE	TERMINATION
TERMINATION	CABLE	TERMINATION	Frame 29 bulkhead		Balance unit
Pressure bulkhead		starboard wing	free socket	coaxial	Type 133-LRU-14A
free socket	coaxial	free socket	V.O.R./I.L.S. 11B		V.O.R./I.L.S. 11B
V.O.R./I.L.S. 9A		V.O.R./I.L.S. 9A			

#### CONNECTOR V.O.R./I.L.S. No. 10 EG7.82.1451

TERMINATION Marker backplate junction box Type EJB-21C Cannon plug V.O.R./I.L.S. 10

coaxial

CABLE TERMINATION Pressure bulkhead free socket V.O.R./I.L.S. 10

#### CONNECTOR V.O.R./I.L.S. No. 10A EG7.82.899

CABLE

coaxial

CABLE

coaxial

TERMINATION Pressure bulkhead free socket V.O.R./I.L.S. 10A

TERMINATION Marker aerial free socket V.O.R./I.L.S. 10A

#### CONNECTOR V.O.R./I.L.S. No. 11 EG7.82.1453

TERMINATION Backplate junction box Type EJB-21B-1 straight plug socket 6 V.O.R./I.L.S.11

TERMINATION

Pressure bulkhead free socket V.O.R./I.L.S.11

#### CONNECTOR V.O.R./I.L.S. No. 11C EG7.82.897

TERMINATION	CABLE	TERMINATION
Balance unit Type		Localizer
133-LRU-14A	coaxial	aerials free
free socket		socket
V.O.R./I.L.S. 11C		V.O.R./I.L.S. 11C

### CONNECTOR V.O.R./I.L.S. No. 15 EG7.82.901

TERMINATION	CABLE	TERMINATION
Inner starboard wing		Starboard wing
rib 6 free socket	coaxial	root free socket
V.O.R./I.L.S.15		V.O.R./I.L.S.15

#### CONNECTOR V.O.R./I.L.S. No. 16 EG7.82.902

TERMINATION CABLE Outer starboard wing rib

2 free socket

V.O.R./I.L.S.16

Inner starboad wing rib coaxial

6 free socket V.O.R./I.L.S.16

TERMINATION

continued . . .

#### **TABLE 1 Connectors** - continued

### CONNECTOR V.O.R./I.L.S. No. 17 EG7.82.903 NATION CABLE TERMINA

coaxial

TERMINATION Glide path aerial Type 238 free socket V.O.R./I.L.S.17 TERMINATION Outer starboard wing rib 2 free socket V.O.R./I.L.S.17 F.S./1

### UK RESTRICTED

## Chapter 6 RADIO COMPASS

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NOTE. . . Combined theoretical/routeing diagrams for this installation are contained in A.P. 101B-0417-10 (Servicing Diagrams Manual).



EG7 82 241 ISS 6 EG7 82 5235 ISS 1

### FIG. 1. RADIO COMPASS A.R.I. 5877 INSTALLATION

#### DESCRIPTION

#### General

1. A Marconi Type AD722 sub-miniature radio compass (A.R.I. 5877) is fitted to the aircraft. The installation is also known as Automatic Direction Finding (ADF) and is identified thus on the intercomm. station boxes. The system is a navigational aid which gives an indication of the bearing of a radio transmitter to whose frequency the receiver is tuned. The receiver operates on frequencies in the range from 200 kHz to 1700 kHz.

2. The installation comprises a Type A8281 R.F. amplifier, a Type A8282 I.F. amplifier, a Type 8283 control unit, a loop aerial, a sense aerial and three indicator units. Detailed information on the equipment is given in A.P. 116B-0102-16.

#### R.F. amplifier

**3.** The R.F. amplifier is located on a Type 8288 mounting tray, fitted on a bridge over the I.F. amplifier, under the navigator's table. The amplifier contains the R.F. circuits and balanced modulator sections of the receiver. Tuning of the receiver is effected by a flexible cable drive from the control unit which transmits the operation of the tuning handle on the control unit to the permeability-tuning system in the R.F. amplifier. Changes of frequency band are made by a motor-driven switch which is controlled by the selector switch in the control unit. The connecting cables and the flexible drive are terminated on the mounting tray and connect to the amplifier when it is installed on the tray by two mating plugs and sockets and a drive coupling.

#### I.F. amplifier

4. The I.F. amplifier is located on a Type 8289 mounting tray, fitted on a shelf under the navigator's table, inboard of the V.O.R./I.L.S. receivers. The amplifier contains the I.F. amplifier stages, detector and A.F. amplifier and output stages. Connections to the unit are made via the mounting in a similar manner to that on the R.F. amplifier, using a single plug and socket. An additional socket, normally fitted with a blanking plug, is provided for the connection of test equipment to the installation.

#### **Control unit**

5. The control unit is located at the navigator's lower panel assembly, above the navigator's table. Tuning of the receiver is achieved by turning the cranked handle below the tuning scale; this is coupled to a flexible drive cable which is connected via the mounting tray to the R.F. amplifier to actuate its permeability-tuning mechanism. The frequency bands of 200 to 415 kHz, 415 to 840 kHz and 840 to 1700 kHz are selected by operation of a switch lever which projects through the panel above the tuning scale. When the lever is operated, the appropriate scale is displayed (calibrated in decimals of M1Iz) and the band-selector switch in the R.F. amplifier set as required.

6. The GAIN control operates on the A.F. output from the detector in the I.F. amplifier before it is introduced to the A.F. output stage. In operation, the ADF volume controls on the station boxes should be set to their maximum positions and the volume of the output adjusted, as required, by means of the GAIN control. The TUNE meter is incorporated to give an indication of signal strength; the tuning control is adjusted to give maximum deflection of the needle. When the ADF/REC switch is set to ADF, the receiver will function as an automatic direction finding equipment. When REC is selected, the equipment functions as a conventional receiver and no bearing information is displayed. The C.W./R.T. switch selects reception of keyed C.W. signals or telephony signals.

7. The tuning scale and panel engravings are illuminated by a single lamp situated below the tuning scale window. Control of the intensity of illumination is effected by the setting of a push-button annotated DIM PUSH. A spare lamp is provided and housed in a holder marked SPARE.

#### Aerials

8. Two aerials are fitted as part of the installation. A Type 8280 loop aerial is housed in the access hatch of the upper equipment compartment. It is a fixed crossed-coil loop aerial, wound on a ferrite core and enclosed in an insulating case. Connections to the ends and commoned centre-tap of the loops are brought out via a six-pole plug in the centre of the case.

9. The sense aerial is located on the upper surface of the port main plane between the fuselage and the engine. The aerial is a rod mounted parallel

to the longitudinal axis of the aircraft on three fibreglass insulators. Connection to the aerial is fed through the forward insulator.

#### Q.E. correction

10. Correction of quadrantal errors (Q.E.), i.e. errors in the polar response of the loop aerial due to circulating R.F. currents in the aircraft structure, is made by the use of a Q.E. corrector unit (Ref. No. 10D/20169). This is mounted adjacent to the loop aerial in the access hatch. It consists of a preset balanced-L inductive attenuator which is inserted in the leads from one of the aerial loops. The connector between the Q.E. corrector unit and the master bearing indicator must not be reduced in length under any circumstances.

#### Indicators

11. Three indicators are included in the system. A Type 9551 electrical indicator and a Smiths Type 21 RNA/CP/1 radio magnetic indicator, (R.M.I.) (Ref. No. 6A/18460) are located at the navigator's lower panel assembly and the navigator's instrument panel respectively. A similar R.M.I. is fitted at the bottom lefthand of the pilot's flight instrument panel, below the omni-bearing selector.

12. The Type 9551 indicator operates as the master bearing indicator. It displays the bearing of the radio transmitter relative to the aircraft heading. This bearing information is relayed to the R.M.I.'s by means of a synchro transmission system.

13. The R.M.I. has two pointers which move over the face of a rotating compass card. The compass card is driven by an integral servo system which is supplied with information from the G4B compass system (Sect.

7, Chap. 4) and gives an indication of the magnetic heading of the aircraft against a fixed lubber mark at the top of the bezel. The magnetic bearing of the transmitter to which the radio compass is tuned is indicated by a red single-bar pointer. The bearing of a V.O.R. transmitter is shown by a green two-bar pointer. Magnetic bearings of these transmitters are indicated with respect to the compass card; relative bearings are shown by the relationship of the pointers to the lubber mark.

#### Power supplies

14. The 28V d.c. power supply required for radio compass is obtained from busbar PP8 in the E.C.P. via fuse No. 175. The supply is controlled by the ON/OFF switch on the control unit. The 26V 400 Hz a.c. supply for operation of the indicators' synchro systems is obtained from a transformer in the radio fuse and relay box (Sect. 6, Chap. 4 and 11).

#### SERVICING

#### WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

#### General

**15.** Components and cables should be checked periodically for damage. General servicing is straightforward and the removal and assembly of equipment should not present undue difficulties. Detailed servicing of individual units is contained in A.P. 116B-0102-16.

#### TABLE 1

#### Connectors

CONNECTOR Q.A. EG7.82.429					
Termination	Pin	Cable	Pin	Termination	
	$\int 1$	RPC1533	1)		
Q.E. corrector	] 2	RPC1533	2	Aerial loop	
unit plug	4	RPC1533	4 (	socket	
Q.A.	5	RPC1533	5 ]	Q.A.	

Pin 3 is connected to screening of pins 1 and 2. Pin 6 is connected to screening of pins 5 and 4.

### CONNECTOR Q.B. EG7.82.431

Termination	Pin	Cable	Pin	Termination
	( A	RPC1533	1)	
Pressure bulkhead	Јв	RPC1533	2	Q.E. corrector
plug Q.B.	) D	RPC1533	4	unit socket Q.B.
	E	RPC1533	5 )	

Pin C is connected to screening of pins A and B. Pin F is connected to screening of pins D and E. Pin 3 is connected to screening of pins 1 and 2. Pin 6 is connected to screening of pins 4 and 5.

#### CONNECTOR O.B.1 EG7.82.433

Termination	Pin	Cable	Pin	Termination
	$\begin{bmatrix} 1 \end{bmatrix}$	RPC1533	E )	
Bearing indicator	) 2	RPC1533	D	Pressure bulkhead
Type 9551 socket	] 3	RPC1533	в	socket
Q.B.1	4	RPC1533	A	Q.B.1

Pin 5 is connected to screening of pins 1, 2, 3 and 4.

CONNECTOR Q.C. EG7.82.435					
Termination	Pin	Cable	Pin	Termination	
	$\int 1$	BICC1534	QC/B	R.F. amplifier coax	
Master				socket yellow	
bearing indicator				Q.C.B.	
Type 9551 socket	$\langle 2$	BICC1534	24		
Q.C.	3	BICC1534	15	≻ R.F. amplifier	
	4	BICC1534	25	Q.C.A.	
	5	BICC1534	QC/C	R.F. amplifier coax	
				socket red Q.C.C.	

#### CABLE ASSEMBLY Q.D. SCSHQ 127090/1

Termination	Pin	Cable	Pin	Termination
R.F. amplifier		<b>UR64</b>		Pressure bulkhead
Type A8281				break Q.D.

#### CABLE ASSEMBLY Q.D. SCSHQ 127090/2

Termination	Pin	Cable	Pin	Termination
Pressure bulkhead		<b>UR64</b>		Sense aerial
Break Q.D.				

CONNECTOR Q.E. EG7.82.5329						
Termination	Pin	Cable	Pin	Termination		
	(1)	N20	1)			
	2	N20	2			
	3	N20	3			
	4	N20	4			
Control unit	$\downarrow$ 5	N20	14	R.F. amplifier		
plug Q.E.	6	NMS20	18	Q.E.		
	7	N20	6			
4	8	NMS20	8			
	9	N20	19			
	10	N20	22			
				continued		

### **TABLE 1 Connectors** - continued

CONN	NECTOR O	E. EG7.82.53	329 - conti	inued	CONNE	CTOR C	.H. EG7.82.44	13 - conti	inued
Termination	Pin	Cable	Pin	Termination	Termination	Pin	Cable	Pin	Termination
	[ 11	N20	4		1	18	022	22	
Control unit	12	N20	14	R.F. amplifier		19	QMS20	8	
plug Q.E.	Ύ 13	N20	12	≻ Q.E.	I.F. amplifier	20	OMS20	18	R.F. amplifier
	14	N20	21		free socket 🛛 🔾	21	022	23	➢ ring-tongue tags
	L 15	N20	20 J		Q.H.	22	022	4	Q.H.
						23	022	4	
100									

At end R.F. amplifier, pin 9 is connected to screening of pin 18, and pin 17 is connected to screening of pin 8.

CONNECT	OR Q.G. EG	7.82.441		
Pin	Cable	Pin	Termination	

Termination	Pin	Cable	Pin	Termination
	6	N20	E25	
÷	7	N20	E25	
Control unit free	8 (	N20	E25	Electrical control
socket Q.G.	5 9	N20	R5	panel Q.G.
	10	N20	R5	
	11	N20	R5 )	

	CONNECTOR Q.H. EG7.82.443							
Termination	Pin	Cable	Pin	Termination				
	$\int 1$	QMS20	10					
	2	Q22	9					
	3	022	9					
	4	QMS20	7					
	5	022	24					
I.F. amplifier	] 6	Q22	25	R.F. amplifier				
free socket	<u>ງ</u> 7	Q22	13	ring-tongue tags				
Q.H.	9	022	20	Q.H.				
	10	Q22	12					
	11	022	21					
	12	Q22	15					
	15	022	5					
	16	Q22	5					
	L 17	022	19					

# 25 16 J QMS20

At end I.F. amplifier, pin 14 is connected to screening of pin 1 and pins 4, 19, 20 and 25 are connected to screening of pin 24. At end R.F. amplifier, pin 11 is connected to screening of pin 10.

### CABLE ASSEMBLY O.J. EG7.82.5517

Termination	Pin	Cable	Pin	Termination
R.F. amplifier	14	NMS22	2	T.B. 3668/1
Q.J.	23	NMS22	1	Q.J.

### CONNECTOR Q.K. EG7.82.447

Termination	Pin	Cable	Ident	Pin	Termination
	( A	14/.0076	White	1)	
Junction	В	14/.0076	White	2	Radio compass
box tails	ζc	14/.0076	White	3	≻ bearing indicator
Q.K.	D	14/.0076	White	4	Cannon socket
	LE	14/.0076	White	6 )	Q.K.

#### CABLE ASSEMBLY Q.L. EG7.82.451

Termination	Pin	Cable	Ident	Pin	Termination
	( A	14/.0076	White	1)	R.M.I.
Junction	E	14/.0076	White	2	Nav's panel
box tails	ζc	14/.0076	White	3 >	free
Q.L.	В	14/.0076	White	4	Cannon socket
	D	14/.0076	White	5 )	Q.L.

continued . . .

### TABLE 1 Connectors - continued

### CABLE ASSEMBLY Q.L./144 EG7.82.449

.

Termination		Pin	Cable	Ident	Pin	Termination
	1	Γ A	14/.0076	White	1)	R.M.I.
Junction		E	14/.0076	White	2	Pilot's panel
box tails	≺	С	14/.0076	White	3 >	free Cannon
Q.L./144		В	14/.0076	White	4	socket
	ļ	D	14/.0076	White	5)	Q.L./144

## Chapter 8 OMEGA NAVIGATION SYSTEM (A.R.I. 23314)

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Mounting						•									•						•		4
Antenna coupler unit					•								•	•						•			5
GM4B compass installation								•	•			•			•	•	•			•	•		6
True airspeed unit																		•		•			7
Total head thermometer .	•																•						8
Lighting			•						•							•			•	•	•		9

	Omega junction box	
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EG7 82 5985 SH.1 ISS.3 EG7 82 5985 SH.2 ISS.3

FIG. 1. OMEGA NAVIGATION SYSTEM (A.R. I.23314) INSTALLATION

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#### DESCRIPTION

#### General

1. Omega Navigation System (ONS) is a worldwide, all-weather navigation aid which operates in the VLF band using signals from three out of eight ONS ground stations, or four out of nine VLF communication stations. As a back-up to the primary ONS/VLF mode of operation, a dead-reckoning (DR) mode is provided. This mode is automatically selected when the number and quality of received ONS/VLF signals falls below the levels required for accurate navigation. The main components of the installation consist of a control display unit, receiver processor unit, antenna coupler unit and true airspeed unit.

#### **Control display unit**

2. The control display unit is located at the navigator's control panel, in the upper centre position. It contains an arrangement of push-buttons, switches, indicators and digital read-outs, to enable the operator to insert data, extract data, interrogate the computer and override some automatic functions. All input and output connections are made via a multi-pin plug at the rear of the unit.

#### **Receiver/processor unit**

3. The receiver/processor unit (RPU) is positioned on the rear pack bay shelf, between frames 27 and 28. The RPU receives r. f. input signals from the antenna coupler unit together with the airspeed input (from the true airspeed unit) and the heading input (from the GM4B compass master indicator). Various electronic components within the RPU process the input data to provide present position and navigation guidance parameters, required for an accurate airborne navigation readout.

#### Mounting

4. A mounting tray located on a rack in the rear equipment bay is used to secure the RPU. The RPU is held in position on the mounting tray by guide pins and quick release knurled knobs. The mounting tray contains a multi-pin connector at the rear which mates with the RPU.

#### Antenna coupler unit

4 5. The antenna coupler unit (ACU) is fitted in the tail between ribs 1 and 2, mounted flush against the outside. The ACU consists of two ferrite rods at right angles to each other which operate as an H-field, bi-directional loop antenna. The unit which is designed to optimize reception of the 10 to 14 kilohertz Omega signal, contains several stages of amplification to achieve a very-high sensitivity.

#### **GM4B** compass installation

6. The ONS installation is interconnected with the GM4B master indicator. The master indicator provides heading input data to the ONS, controlled by the compass/DG switch.

#### True airspeed unit

7. This unit provides airspeed information which is transmitted to the receiver/processor unit. The true airspeed unit is mounted behind the navigator's instrument panel.

#### Total head thermometer

8. This unit is installed on the fuselage skin, port side, between frames 4 and 5. It supplies external temperature data to the installation.

#### Lighting

**9.** Integral lighting of the Omega control unit is provided by a lighting transformer. The transformer steps-down the 115 volt a. c. supply, fed from the 400 Hz fuse box, to 5 volts a. c. This 5 volt output to the control unit lighting is brilliance controlled by a dimmer switch, situated at the navigator's station.

#### Omega junction box

10. The Omega junction box is installed in the rear fuselage, just starboard of the centreline, between frames 29 and 30. This contains the transformer and the rectifier circuit/relay assembly.

#### Undercarriage interlock

11. Interconnection with the undercarriage oleo micro switch, via a relay, inhibits the navigation process when the aircraft is on the ground. On the ground the relay is energized by the oleo microswitch, putting an earth on pin A27 of the receiver processor unit, via the Omega FLT/GRD test switch.

#### Power supplies

12. Both a. c. and d. c. supplies are required to operate the Omega installation. The installation is supplied with 28-volt d. c. from fuse 166 via the

►

Omega switch. A single-phase 115 volt a.c. supply is provided from an inverter. A.C. power from the inverter, situated between frames 9 and 10, is supplied via paralled fuses 105 and 106, in the No.2 distribution box, to the Omega junction box. Part of this a.c. supply is steppeddown to 26 volt a.c. by a transformer within the junction box.

### Flight/Ground test switch (FLT/GRD test switch)

13. For test purposes pin A27 on the Omega receiver/processor unit can be disconnected from earth, whilst the aircraft is on the ground. This is achieved by selecting GRD TEST on the Omega FLT/GRD test switch.

### Universal transverse mercator (U.T.M.) mode switch

14. This switch is installed on the navigator's flight instrument panel and is annotated OMEGA U.T.M. MODE SW. The U.T.M. mode switch is an on/off switch, which when selected to the ON position changes the type of co-ordinates shown on the control display unit from land to sea (mercator).

#### SERVICING

#### WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

#### General

◄ 15. Components and cables should be checked periodically for damage. General Servicing is straightforward and the removal and assembly of equipment should not present undue difficulties. Servicing information on the equipment is contained in A.P. 116B-0617 series.



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### TABLE 1 Cable assembly details

	CONNECTOR	ONS 1 EG7.82.5473		CONNECTOR ONS 1 EG7.82.5473 - continued						
TERMINATION	PIN/	CABLE PIN/	TERMINATION	TERMINATION	PIN/	CABLE PIN/	TERMINATION			
	TERMINAL	TERMINAL		,	TERMINAL	TERMIN	AL			
	( A	N )		Omega flt/grd test	2	R	Pressure bulkhead			
G4B compass	В	Р	Pressure bulkhead	switch (ONS 1K)			(ONS 1A)			
master indicator	$\langle c \rangle$	σ≻	(ONS 1A)	<ul> <li>U.T.M. mode</li> </ul>	∫ 2	S	Pressure bulkhead			
(ONS 1E)	D	E		switch (ONS 1L)	] 3	т	∫ (ONS1A) 🛛 🕨			
	LE	c J		Omega control unit	t D	1	Dimmer unit			
	( a	A )		(ONS 1F)	<i>c</i>		> (ONS 1D)			
	ь	в		Lighting	∫ 5	2	)			
	<u>c</u>	С		transformer	<b>1</b>	E	Omega control			
	d	D		(ONS 1C)			unit (ONS 1F)			
	е	E			E26	3	Omega flt/grd			
	f	F					test sw (ONS 1K)			
	U	н		Earth stud	Ύ E26	G	True airspeed			
	V	J		(ONS 1J)	E26	Paralle	unit (ONS 1B)			
Omega control	w	к				connect	or			
unit	≺ ×	ι≻	Pressure bulkhead			(at pin (	C)			
(ONS 1F)	Y	M	(ONS 1)	Inverter switch	3	5	Compass/d.g.			
	Z	N		(ONS 1H)			switch (ONS 1G)			
	J	P								
	ĸ	R		Screens from cores	J, K, L, M, R,	, S, T, U, V, W, X, Y	, Z (at end ONS 1F)			
	L	S		connected to pin F						
	M	т								
	R	U		Screens from cores	H, J, K, L, M,	, N, P, R, S, T, U, V	, W (at end ONS 1)			
	S	v		connected to pin G						
	Т	w								
	( g	хJ		Screens from cores	C, D, E, F, G,	, H, L, M, N, P (at e	nd ONS 1A) con-			
	( D	F )		nected to pin B.						
	J	G			00000000000					
True airspeed	) c	н		TERMINATION	CONNECTO	R ONS 2 EG7.82.54	75			
unit	ĴК	J	Prosecure buildhood	TERMINATION	PIN/	CABLE PIN/	TERMINATION			
(ONS 1B)	н	ιþ	(ONS1A)	No. 2 dist	LERMINAL	TERMIN				
	LВ	M	(ONSTA)	NO.2 dist.	F106	A	Umega junction			
Compass/d.g.	4	A		DOX, Tags	$\prec$ $^{+105}$	В	Dox (UNS 2E)			
switch (ONS 1G)				(UN52H)	TRACT					
Inverter switch	3	z J		Deserving build by t	С I.B.6 (—) ¬	NIG B	Conega junction			
(ONS 1H)		2		(ONS 2A)	Z		Dox (UNS 2D)			

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continued . . .

CON	NECTOR ONS	2 EG7.82,5475 - conti	inued	CONNECTOR ONS 2 EG7.82.5475 - continued						
TERMINATION	PIN/	CABLE PIN/	TERMINATION	TERMINATION	PIN/ CABLE	PIN/	TERMINATION			
	TERMINAL	TERMINAL			TERMINAL	TERMINAL				
	ſι	GÌ			_					
	м	н (	Omega junction	Pressure bulkhead	ſv	B62 ]				
	N	J	box (ONS 2E)	(ONS 2)	Υw	B63				
	Р	ĸ		10113 21	( x	B67				
		A2 )								
Pressure bulkhead	C	A9		< Omena iunation	A	A5				
(ONS 2A)	Ϋ́	A10		how (ONE 2K)	⊀в	A31				
(0.10 2.1.)	F	A11	Receiver/	DOX (ONS ZK)	С	A4	•			
	F		processor unit		C		-			
	G	A22	(ONS 2C)		C	B1				
	L L	A22	(0113 20)		D	B10				
	1 7	A23			10 L	A66				
		20	DT too miles No. 1	Omega junction	M	A67				
		34	RT tag, relay No. 1,	box (ONS 2E)	$\prec R$	A46	Receiver/			
			No. 1 distribution		S	A47	processor unit			
	( .	2	panel (ONS 2B)		T	A37	(ONS 2G)			
<ul> <li>Pressure bulkhead</li> </ul>	) s	A8	Receiver/		U U	A38	(0110 20)			
(ONS 2A)	ĮΤ	* )	processor unit		lv	A56				
	<b>C</b>	2	(ONS 2G) 🕨	BT tag_relay	3	A27				
	~			No. 1 No. 1 dist	Ū	~~~				
	( A	B6 )		box (ONS 2B)						
	В	B7		50X (0110 25)		( A36				
	С	B14			an a	A53				
	D	B15			connected together					
	Ε.	B16			by a parallel splice	A17				
	F	B17		BT tag (ONS 21)	F21	PE				
	н	B35		Omena junction						
	J	B36		box (ONS 2E)	1 E					
Pressure bulkhead	ĸ	B37	Receiver/	(0110 21)	Parallel connector					
(ONS 2)	$\prec$ L	B38 >	processor unit		(at nin R50)	C	Cooling for			
	M	B39	(ONS 2G)	Beceiver/	(at pin 000)					
	N	B40		processor unit	Devallel compositor		(0115 21)			
	Р	B47		(ONE 2C)	Paranel connector	U J				
	R	B48		(010320)	(at pin Bio)					
	S	B49		• (	B5/ [	Darallel splice r	narked above			
	Т	B50			A19 - connected to A2	2, via splice	(UNS 2G)			
	U	B61			A20 - connected to A2	3, via splice				
							continued			

TABLE 1 Connector assembly details - continued

### TABLE 1 Connector assembly details - continued

S	Screens from core	es H, J, K, L, I	M, N, P, R	, S, T, U, V, W		CONNECTOR ONS 6 EG7.82.5937							
c S E	connected to pin Screens from core 3.	G. es C, D, E, F, (	G, H, (at e	nd ONS 2A) c	onnected to pin	TERMINATION	PIN/ TERMINAL	CABLE	PIN/ TERMINAL Fuse 143	TERMINATION			
<b>▲</b>	FERMINATION	CONNECTO PIN/ TERMINAL	R ONS 3 I CABLE	EG7.82.5933 PIN/ TERMINAL	TERMINATION	(ONS 6)			Fuse 143	) panel (ONS 6A)			
i r	Receiver/ processor unit	P3		P1	Antenna coupler unit								
							CONNEC	TOR ONS	7 EG7.82.59	41			
		CONNECTOR	R ONS 4 E	G7.82.5935									
						TERMINATION	PIN/	CABLE	PIN/	TERMINATION			
Т	ERMINATION	PIN/	CABLE	PIN/	TERMINATION		TERMINAL		TERMINAL				
		TERMINAL		TERMINAL		Inverter control	Т3		E29	Earth stud (ONS 7A)			
	Inverter	( J		Fuse 105	No.2 distribution box,	box (ONS 7)							
	control	) L		EW ∫	(ONS 4C)								
	unit	ĴК		E29	Earth (ONS 4B)								
	(ONS 4)	Lм		T4	Terminal, inverter								
					control box (ONS 4A)		CONNEC		9 507 92 50	60			
							CONNEC		0 EG7.02.59	03			
		CONNEC	TOR ONS	5 EG7.82.59	39	TERMINATION	PIN/	CABLE	PIN/	TERMINATION			
т		DIN/	CARLE	DIN/	TERMINATION		TERMINAL	VINCE	TERMINAL				
	ERMINATION	TERMINAL	UNDLE	TERMINAL	ENMINATION	Inverter	E29		E29	Earth stud (ONS 8A)			
N	o 2 distribution	TR6		T2	Inverter control	mtg. foot	5. E.						
t	ox (ONS 5A)				box (ONS 5)	(ONS 8)							